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NOTES, NEWS, AND QUERIES

Raptor Research News. The editors are happy to see this double issue complete the volume for 1971. We are pleased that our readers have borne with us as we have tried to get back on schedule following earlier delays. We are happy also that our new Editor, Dr. Richard R. Olendorff, is hard at work and the first issue in our new format as *Raptor Research* is ready for printing. The first several parts of the supplement on the Special Conference on Captivity Breeding of Birds of Prey are also being processed. An analytical index for Volumes 4 and 5 has been started but its completion is postponed until current publications are on schedule.

The present editors have noted that some readers have been confused on the editorial policy of this journal. From time to time we have published papers which have not presented new information, but have given an individual's point of view. Publication of such papers does not necessarily constitute endorsement by either *Raptor Research News* or by Raptor Research Foundation. Instead our aim has been the stimulation of discussion by presenting varied points of view.

Another source of confusion has been extensive reports of meetings or conferences. We have felt that such reports would help our readers know what is going on; it is never intended that specific items of data mentioned would supercede more formal reports. Readers should avoid citing these meeting reports unless they consult with the person responsible for the original data; usually a more adequate primary source will be available. In order to emphasize the differences between original research and secondary sources in the future these materials will be in different parts of the journal.

Conference on Raptor Conservation Techniques – Date Correction. Because of unavoidable conflict the dates listed in the last issue of the *News* will have to be changed. The conference will be held March 18-21, 1973. Further information will be announced later.

This change in date will be a disadvantage to those concerned with breeding, so a special meeting is being organized on this topic for early fall 1972.

Raptor Research Abstracts. The first issue of this new journal is in preparation. It will consist mostly of a detailed description of the processing procedures for the preparation of the individual abstracts. It will thus serve as a general introduction for the user but will also be a guide for the cooperator who has agreed to survey the literature of a particular journal. As soon as this issue is out recruitment of cooperators will begin.

North American Osprey Research Conference. The Department of Biology at the College of William and Mary, Williamsburg, Virginia, sponsored this conference February 10 to 12, 1972. A printed Proceedings of the Conference is planned by the sponsor.

Ireland Peregrine Survey—Fourth Year. There apparently were at least 163 pairs of Peregrines breeding successfully in the Republic of Ireland about 1950. When the Peregrine Survey began in 1967 only 36 pairs which seemed to be breeding successfully were found, and in 1969 only 16 pairs. The Survey was continued in 1970 and a total of only 14 pairs were found which were breeding or probably breeding successfully. Even this included one previously unknown breeding site. A number of cliffs which had held breeding pairs in 1969 were not occupied by a breeding pair this year, and vice versa. The 1970 results therefore confirm the very substantial, widespread and unprecedented decline in the breeding population since 1950, and even since 1967, and confirm that the remaining pairs exhibit much breeding failure. (Only four cliffs are known to have held successfully breeding pairs in all of the years 1967-1970). David Norriss, the Trinity graduate who has been doing research on pesticides in the prey of the Peregrine, as a result of the findings of the Peregrine Survey, took an active part in the Survey in 1970, and the I.W.C. have been helping him with his work. He is lecturing on his research at the 1971 All-Ireland Conference in Co. Down. We are grateful to him, and to the Royal Irish Academy, for help with the Survey.

Fourteen pairs may not be the total Irish population still breeding, as not every site used in the past was visited in

1970. However, checks at other cliffs, and the very few records of Peregrines produced by Atlas observers, suggest that very few breeding pairs are missed by the Survey.

(From *Report of the Irish Wildbird Survey* 1970, p. 9, sent in by J. J. Hickey.)

Pole Shooters. The extent to which birds of prey are being shot at by that small but unsavory segment of gunners known as "road hunters" is shown in the results of a recent study in Utah.

The survey centered on a 12-mile stretch of gravel road paralleled by utility poles, which hawks, eagles, and owls regularly use as perches.

On the first count, 30 birds were found dead. In a year and a half, 47 eagles and hawks, plus one great horned owl, were found dead in the survey area. Twenty-six were golden eagles, including four found under two adjacent poles. Most of the eagles were immature birds, unafraid of humans. (From *Outdoor Oklahoma,* November 1971, sent in by M. Alan Jenkins.)

California Condor Colony Reported in Mexico. The nearly extinct California condor may be alive and well in Mexico.

Evidence that a formerly undiscovered colony of the rare bird may be living on the Baja California Peninsula was released last week following a 10-day expedition into the area in late June.

In a joint announcement, representatives of the Mexican government and the Western Foundation of Vertebrate Zoology reported the findings of the expedition, which was prompted by sightings of the giant vulture in the mountains of north-central Baja California, Mexico.

David Siddon, a freelance writer and nature enthusiast, led the four-man expedition into the western slopes of the mountains. He reported seeing one of the birds perched on a pine tree from a distance of about 250 yards.

Although no photographs of the bird were taken, more tangible proof of the presence of the condor in Mexico rests on four authenticated feathers found near and photographs of large tracks found nearby.

(From *Minneapolis Tribune,* August 15, 1971.)

RAPTOR RESEARCH SURVEY: 1971

Adamson, J. C. (5000 Rocklin Rd., Rocklin, CA 95677); Requirements for successful captive breeding of avian carnivores, in particular *Falco columbarius* (in progress).

Allen, David E. (11332 Sunnyslope, Kansas City, MO 64134); Captivity Breeding (in progress).

Anderson, D. W. (Bur. Sport Fisheries & Wildlife, PO Box C, Davis, CA 95616); Eggshell changes in European raptors (with J. J. Hickey, manuscript in preparation); (see Hickey, J. J.).

Berry, R. B. (see Ward, F. P., 3).

Belyea, Glenn Y. (2700 Eaton Rapids Rd., No. 121, Lansing, MI 48901); A population study of Red-tailed Hawks and Great Horned Owls in southern Michigan (temporary title, in progress).

Bierregaard, Richard (Taylor Rd., Mt. Kisco, NY 10549); (1) Breeding biology of the Harriers on Martha's Vineyard, MA (in progress); (2) Effect of nest site availability on American Kestrel populations (in progress); (3) Eggshell weights of North American accipiters (planning); (4) Visual anti-prey adaptations in birds of prey (manuscript).

Bos, J. Henri (Box 1019, OSRO, Bio-Medical Research Institute, Kamuela, HI 96743); Distribution and home range of *Buteo solitarius* (in progress).

Brisbin, I. L., Jr. (Drawer E, Ecology Lab., Aiken, SC 29801); (1) Bioenergetics of growth in nestling hawks and owls (in progress); (2) Body composition and caloric density of growing raptors (in progress); (3) Bioenergetics of breeding cycle of captive-breeding raptors (in progress); (4) Biological accumulation and half-life of ^{137}Cs in raptors of the AEC Savannah River plant (in progress).

Brooker, M. G. (CSIRO, Dept. of Wildlife Research, Clayton Rd., Helena Valley, W. Australia); Ecology of the Wedge-tailed Eagle (*Aquila audax*) (in progress).

Bush, Robert E. (720 N. Tropical Trail, Merritt Island, FL 32952); Habitat simulation for captive breeders, a theoretical discussion of environmental determinants of aggressive and breeding behavior (nearly finished).

Campbell, R. Wayne (301-621 Gilbert Rd., Richmond, BC, Canada); Raptor populations in southwestern British Columbia (planning).

Catlin, P. Miles (104 Victoria Park Ave., Toronto 13, Ontario, Canada); Studies of owls in Ontario, Canada (in progress).

Cleaver, James K. (1311 S. University Blvd., Denver, CO 80210); Post fledging and fledging in raptorial birds—a review (in progress).

Cooper, J. E. (Vet. Res. Lab., PO Kabete, Kenya); Diseases of birds of prey (in progress; several papers published).

Cragg, Peter C. (W. 40, 703 Stadium Dr., San Antonio, TX 78212); Observations of raptors in south Texas chaparral country (in progress).

Duke, Gary E. (Col. Vet. Med., University of Minnesota, St. Paul, MN 55101); (1) Standard metabolic rate of Great Horned Owls under several environmental conditions (planning); (2) Transit times and metabolizability of two diets for Great Horned Owls (planning).

Ellis, David (Montana Cooperative Wildlife Research Unit, Univ. of Montana, Missoula, MT 59801); Nesting behavior of the Golden Eagle (in press).

Ellis, Lon E. (950 N. Tropical Trail, Merritt Island, FL 32952); Bald Eagle reproduction, east coast (central) Florida (in progress).

Enderson, James H. (See Temple, S. A., 4).

Fairchild, D. G. (see Ward, F. P., 1).

Fox, Glen A. (Dept. of Zoology, Univ. of Alberta, Edmonton 7, Alberta, Canada); Recent changes in the reproductive success of the Pigeon Hawk (*J. Wildlife Management* 35(1): 122-128, 1971).

Fyfe, Richard (Can. Wildlife Service, 10015 103rd Ave., Edmonton, Alberta, Canada); Prairie Falcon breeding behavior (in progress).

Halliwell, Wm. H. (Dept. of Vet. Path., University of Missouri, Columbia, MO 65201); Avian pox in immature Red-tailed Hawk (submitted to *J. Wildlife Diseases*, Feb., 1971).

Hamerstrom, Frances (Plainfield, WI 54966); (1) Ambrose [Great Horned Owl] (in *Alive in the Wild*, Prentice-Hall, 1970); (2) A hawk in Louisiana [Prairie Falcon] (*The Falconer*, 1970); (3) *An Eagle to the Sky* [Golden Eagle] (Iowa State University Press, 1970); (4) Harrier population study 1968-1969 (*Raptor Research News*, 1970); (5) Three poisons [DDT] (*Passenger Pigeon*. 1970); (6) How to visit the nest of a ground nesting bird (Memo to All Bird Banders, U. S. Department of Interior, 1970); (7) Dead on my kitchen floor

[Peregrine Falcon] (*Purple Martin Capital News*, 1970); (8) Cloacal sexing of raptors (*Auk* 88(1):173-174, 1971).

Heintzelman, Donald (629 Green Street, Allentown, PA 18102); The hawks of New Jersey (*Bulletin* 13, *New Jersey State Museum*, 103 pp., 1970.

Heugly, Leo (222 N. 1200 W. No. 37, Orem, UT 84057); Golden Eagle–Domestic Sheep interaction in central Utah (planning).

Hickey, J. J. (Dept. of Wildlife Ecology, University of Wisconsin, Madison, WI 53706); Mercury levels in Peregrine Falcons (manuscript nearly finished, with D. W. Anderson); (see Anderson, D. W.).

John, David T. (Dept. of Zoology, Univ. of Georgia, Athens GA 30601); Captive breeding of a pair of Rufous-thighed Falconets (in progress).

Johnson, Donald (Biology Dept., Univ. of Idaho, Moscow, ID 83843); Productivity and food habits of northern Idaho Ospreys (one year of data).

Johnson, Sara (Dept. of Zoology, Montana State University, Bozeman, MT 59715); Reproductive ecology of Red-tails of Gallatin Valley, Montana, a telemetry study on the post-fledgings (in progress).

Koplin, James (School of Natural Res., Humboldt State College, Arcata, CA 95521); Flathead Lake Osprey study (in progress).

Kuyt, Ernie (Box 85, Ft. Smith, N.W.T., Canada); Distribution, breeding biology, and population changes of raptors in the Thelon Game Sanctuary, N.W.T. (finished first draft of manuscript).

Magee, William R. (8305 Slough Rd. NW, Carroll, OH 43112); Breeding Red-tails at tame hack (in progress).

Marti, Carl D. (Dept. of Zoology, Weber State College, Ogden, UT 84403); Ten year analysis of Barn Owl foods (nearly finished).

Mesch, Ken (Dept. of Biology, Univ. of Colorado, Boulder, CO 80302); Mating behavior of the Harris Hawk (manuscript).

Mueller, Helmut C. (Zoology Dept., Univ. of North Carolina, Chapel Hill, NC 27514); An experimental analysis of some aspects of predatory behavior (in progress).

Nicholls, Thomas H. (North Central Forest Experiment Station, Folwell Ave., St. Paul, MN 55101); Barred Owl habi-

tat use as determined by radio telemetry (manuscript).

Ogden, Verland (Rt. 1, Kuna, ID 83634); Nesting ecology of the Prairie Falcon along Snake River in southwestern Idaho (in progress).

Parker, J. W., Jr. (Museum of Natural History, University of Kansas, Lawrence, KS 66044); (1) Ecology and population dynamics of Mississippi Kite (nearly finished); (2) Population fluctuations and activity of Marsh Hawks near a roost in Kansas (manuscript); (3) Effects of vegetational and meteorological factors on the behavior of Marsh Hawks (nearly finished).

Peters, James W. (Box 271A, Piney Grove Rd., Reisterstown, MD 21136); Peregrine breeding in captivity—management problems (in progress).

Ray, Thomas D. (1560 Ogden St. No. 13, Denver, CO 80218); (1) Work on Golden Eagle (in press); (2) Banding techniques (in progress).

Robinson, William H. (Rt. 1, Box 202, Saugerties, NY 12477); Population and ethological studies of the Goshawk in New York State (in progress).

Roseneau, D. G. (Biology Dept., University of Alaska, College, AK 99701); Population, distribution, and food habits of Gyrfalcons (in progress); (see Springer, A. M., 2).

Ross, James T. (708 Dale Ave., Cumberland, MD 21502); (1) Reproductive responses of *Falco mexicanus* in captivity (in progress); (2) Sexing Red-tailed Hawks (in progress).

Ruos, James L. (Stabean Dr., Fulton, MD 20759); Correlation of weather and arctic Peregrine productivity (nearly finished).

Scharf, W. C. (Northwestern Michigan College, Traverse City, MI 49684); (1) Growth and development of nesting Hen Harriers (in press, *Ibis*); (2) Differential growth rates of individual nestling Hen Harriers (in progress); (3) Morphological comparison of two populations of *Circus cyaneas* (in progress).

Scharff, Jim (6300 E. 1st, Box 67, Spokane, WA 99206); Migration study of raptors—wind, weather, flyways, etc. of the Pacific Northwest, with migrating and wintering birds of prey (in progress).

Scott, Vere H. (Dept. of Mines & Nat. Res., 1301 Ellice Ave., Winnipeg R3G0Gi, Manitoba, Canada); Survey of rare raptors in southwestern Manitoba (planning).

Servheen, Christopher (Wildlife Research Unit, Univ. of Montana, Missoula, MT 59801); (1) Factors affecting pesti-

cide induced mortality in young birds with special reference to the Golden Eagle (manuscript); (2) Molt study of Golden Eagle (in progress).

Snelling, John C. (17 Lake Rd., Dryden, NY 13053); (1) Ecology of African eagles (manuscript); (2) Biocide contamination of African falcons and accipiters (manuscript).

Snyder, Helen (see Snyder, N.).

Snyder, Noel (5113 127th Ave., Tampa, FL 33617); Ecology and behavior of American accipiters (last year of 3-year study with Helen Snyder).

Society for the Preservation of Birds of Prey (PO Box 293, Pacific Palisades, CA 90272); (1) Southern California raptor populations (in progress); (2) State and provincial laws relating to raptor protection (in press).

Spofford, Walter R. (Aviana, Box 428, Etna, NY 13062); Survey, populations of Appalachian Golden Eagles (continuing).

Springer, A. M. (Biology Dept., University of Alaska, College, AK 99701); (1) Population, distribution, food habits, and pesticide of Rough-legged Hawks (in progress); (2) Breeding biology and pesticides of Hawk Owl (with L. G. Swartz, D. G. Roseneau, W. E. Walker, in progress).

Stendell, Rey C. (Museum of Vertebrate Zoology, University of California, Berkeley, CA 94720); Some aspects of the relationship between a population of White-tailed Kites and its prey (nearly finished).

Swartz, L. G. (Biology Department, University of Alaska, College, AK 99701); Photoperiodic responses and captive breeding of Merlins, Peregrines, Gyrfalcons (manuscript in preparation); (see Springer, A. M., 2).

Temple, Stanley A. (Laboratory of Ornithology, Cornell Univ., Ithaca, NY 14850); (1) Competition and resource utilization by prairie raptors (in progress); (2) Chlorinated hydrocarbons and reproductive success in eastern North American Merlins (in press, *Condor*); (3) Systematics and evolution of the North American Merlins (in press, *Auk*); (4) Nesting behavior of Yukon River Peregrine Falcons (with James H. Enderson; Manuscript); (5) Successive artificial insemination of a Red-tailed Hawk (manuscript).

Vuicich, J. V. (see Ward, F. P., 1).

Walker, W. E. (Biology Department, University of Alaska, College, AK 99701); Ecology, breeding biology, and pesticides of Gyrfalcons; (see Springer, A. M., 2).

Ward, F. Prescott (Med. Res. Lab., Dept. Vet. Med., Edgewood Arsenal, MD 21010); (1) Inclusion body hepatitis in a Prairie Falcon (in press, *J. Wildlife Diseases*, with D. G. Fairchild and J. V. Vuicich); (2) Thiamine deficiency in a Peregrine Falcon (*J. Amer. Vet. Med. Assoc.*, in press); (3) Autumn migration of Peregrine Falcons on Assateague Island in 1970 (with R. B. Berry; submitted to *Auk*, Feb. 1971); (4) Air sac parasitisms in captive falcons (manuscript); (5) Aspergillosis and inclusion body hepatitis in a Peregrine Falcon (manuscript).

White, Clayton (575 Widtsoe Building, BYU, Provo, UT 84601); Aleutian Island Peregrine and Bald Eagle populations (in progress, part in press).

Williamson, David R. (4328 Lambeth Lane, Ft. Worth, TX 76103); Breeding Merlins (planning).

ATTEMPTED BREEDING OF THE GOLDEN EAGLE *(Aquila chrysaetos canadensis)* IN CAPTIVITY

by
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Since birds of prey are at the end of a long food chain, the concentration of pesticides is multiplied in their bodies. These poisons lead to infertile eggs, soft-shelled eggs because of a calcium imbalance, dying embryos or hatchlings, sterility, altered behavior patterns, and even adult mortality. Human population pressures involving habitat take-over and hunting have certainly taken their toll in birds of prey, but the effects of pesticides have been even more devastating. Some species are already endangered.

Some of the ways that the extinction of these birds can at least be slowed down are to stop using pesticides, to set aside adequate natural wildlife preserves, and to attempt to breed these animals in captivity. The following account documents one such attempt.

We received our pair of Golden Eagles on June 23, 1962. Records made in the zoo at that time were very poor, so it is unknown at what age they came in or under what conditions. The cage is a 732 cm (24 ft) square cage with 4 cm (1.5 in) x 8 cm (3 in) mesh wire. The back wall is brick with two inner dens. There are two similar cages on either side for other species of birds of prey.

In this cage there is a central concrete tree with five real tree limbs. The floor is concrete with a running water bath in the left rear corner. In April of 1970, corrugated fiberglas sheets were laid on the top of the cage at the back and extending about six feet out for protection from inclement weather.

In the spring of 1968 the shells of two eggs were found in the cage. No nesting site was available and no courtship or breeding behavior was observed or recorded.

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In the fall of 1968 a three foot platform made of wood and chicken wire was nailed to the upper branch of the tree. During the spring of 1969 a total of four eggs was laid on the platform. Little nesting material was used and neither of the birds showed any interest in the eggs. The first egg was laid on March 24. It was found near the edge of the platform and could have been knocked off and broken. The egg was taken and put in an incubator. On March 28, shells of the second egg were found in the nest. On April 21, the third egg was found in the nest. Since the parents paid no attention to the egg it was taken and placed in an incubator. On April 25, the shells of the fourth egg were found at the bottom of the cage.

The first egg was dull white, with very light purplish blotches and streaks mainly at the larger end. The third egg was completely white. The eggs proved to be apparently infertile. No development was seen on opening them. No courtship or breeding behavior was observed.

During the late summer of 1969 a large nest was built for the eagles in the far left corner of the cage at a height of about 12 feet. A tree trunk of about 15 feet by 10 inches at the largest end was suspended diagonally in the corner of the cage. Tree limbs with an average diameter of 2.5 inches were placed from this main supporting structure to the corner of the cage. Smaller branches were interwoven with the larger ones and finally straw was placed on top. The area of the nest can be measured as approximately 15 feet on the diagonal, 12 feet on the side, and 5 feet on the back wall of the cage. Neither of the birds would go near the nest for about two weeks, but they finally accepted it and eventually used it for what it was.

The diet of our Golden Eagles is mainly chunks of horsemeat and whole chickens. Before and during the breeding season they were given freshly killed wild rabbits on an average of once or twice a week. As a curious interjection, they would have nothing to do with domestic rabbits.

On March 20 attempted copulation was first observed. With much calling to each other, the male jumped on the female's back. She seemed quite agitated and quickly shrugged him off. The pair continued to call to each other during the following days and several attempts were again made by the male. This was always done on the highest perch of the tree. On March 27 and 28, apparently successful copulation was observed. The male would nudge the female to the middle of

the branch and jump on her back. With flapping outstretched wings he stayed there for a few seconds each time. The female obligingly moved her tail to the side.

On the morning of March 30 the female was seen lying on the nest with her tail slightly raised as if incubating. Both birds continually rearranged pieces of straw on the nest but no eggs were seen.

That same afternoon the first egg was found. The female started to incubate it immediately. Since we wanted to get a second clutch of eggs and thereby possibly double the number of young hatched, the egg was removed and placed in an incubator. On April 3 the shells of the second egg were found on the floor of the cage.

During the time between the first and second clutch, a solid wooden egg was prepared. It was the same size and general color as a real Golden Eagle egg. It was decided to replace the third egg with the wooden egg and allow the female to hatch the fourth egg. On April 26 the third egg was found and placed in an incubator. The wooden egg was placed in the nest and the female proceeded to sit on it.

On May 1 the fourth egg was laid and left for the female to hatch along with the wooden egg. However on May 5 the fourth egg was found to be broken so the wooden egg was removed.

Two eggs remained in the incubator but as in the previous year they proved to be apparently infertile. The color on all four eggs was dull white with blotches and streaks of reddish-brown.

During the short time that the eggs were in the nest, only the female was observed sitting. The male, however, was quite attentive, feeding her and rearranging the nest around her constantly.

Brown and Amadon (1968) quote Broley (1952) as reporting cases of Bald Eagles regularly laying infertile eggs for a number of years. Hopefully this is the case with our Golden Eagles. We are looking forward to better results in the future.

Literature Cited

Broley, M. J. (1952). *Eagle Man.* New York. Pelligrini and Cudahy.

Brown, L. and D. Amadon (1968). *Eagles, Hawks, and Falcons of the World.* New York: McGraw-Hill.

AUTUMN EGG PRODUCTION BY CAPTIVE PEREGRINE FALCONS

by
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It has been generally assumed that Peregrine Falcons enter the reproductive cycle and produce eggs as a response to the photoperiod, and experiments aimed at stimulating egg production in captive females by means of the control of light are one of the methods being contemplated or utilized by some individuals and institutions conducting domestic reproduction experiments with this species. In addition, it is further generally assumed that any falcon laying eggs, and then being permitted to incubate such eggs for the full normal incubation period, would be unable to produce eggs again in the same season, particularly in the incubation period carried to near or past the June solstice.

During the past four years members of the Canadian Raptor Society and the British Columbia Falconers' Association have recorded five instances with four different pairs of Peregrines that have run counter to both of these assumptions; that is, eggs were produced and incubated, with both sexes taking part in the incubation, on a decreasing day-length and with no artificial light, and this following full-term incubation of one or more sets of eggs laid earlier in the year.

In 1969 a pair of Peregrines owned by George Galicz laid three eggs in April, incubated these full-term (all were infertile), then during the first week of October produced a second set of three eggs, also infertile, but which were also incubated full-term. This seems to be the first recorded instance of autumn egg-laying by the species at the mid-latitudes.

In 1970 a different pair of birds owned by George Galicz laid three eggs in mid-September following full-term incubation of an earlier set of three eggs laid in mid-April. In the same year a pair of falcons owned by Frank Beebe produced eggs in September and October. This set of eggs was peculiar

in that only two eggs were laid by a falcon that on all other occasions, for a period of eight years, had produced four eggs in every set, and even more peculiar in that the second of these two eggs was laid fourteen days after the first one, and that incubation was delayed until after the second egg was produced. These autumn eggs were laid after full-term incubation and hatching of three of a set of four eggs produced in late June—the third set of four eggs each laid earlier in the same year, amounting to fourteen eggs in all from the one falcon in 1970.

In December of 1971 a female Peregrine Falcon belonging to John Polson which had produced eggs in 1969 as an unmated bird, was paired with a tiercel belonging to Ritchie Jones. This falcon then produced two eggs in mid-June which were incubated for two weeks. These eggs were removed at this time and not returned, due to infertility. Two more eggs were subsequently laid in late August, and full-term incubation of these was permitted, at which time both eggs were broken by the birds themselves. Also in 1971 one of the pairs belonging to George Galicz produced three eggs in late March, incubated these full-term, then laid a second set of three in May only fifteen days after the removal of the first set. Following full-term incubation (without hatching) of these they again laid three eggs in mid-August, and again went through full-term incubation. This pair, then, made three separate laying-incubation reproductive attempts in the one season.

The foregoing would seem to provide ample proof that photoperiod is not a factor governing egg production in the Peregrine Falcon, nor does it appear that full-term incubation always concludes further ovulation in any one year. That none of the eggs produced so far on the shortening photoperiod hatched, or even appeared to be fertile, must, in view of the low fertility of even May and June-laid eggs, remain inconclusive, although it may indicate an inability on the part of the male, and photoperiod linked to spermatogenesis can not, as yet, be entirely ruled out. The males, nevertheless, were involved in incubation in all of these instances.

With these cases now on record the production of eggs by captive falcons exposed to artificial light can no longer be looked upon as being a response to the manipulation of the photoperiod, and even the production of fertile eggs, should it occur, may also be coincidental, and should be viewed with caution.

RESEARCH PLANNING CONFERENCE ON PEREGRINES AND OTHER BIRDS OF PREY CORNELL UNIVERSITY, ITHACA, NEW YORK, NOVEMBER 7-9, 1969 – Part 3

by
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[Part 1 was published in *Raptor Research News* 5(3):92-95, 1971, and Part 2 was published in *Raptor Research News* 5(4):123-130, 1971.]

Session of November 8, 1969

Bald Eagles

Alexander Sprunt IV (Florida, Maine, Wisconsin, Alaska). Table 5 summarizes data collected from Maine, Wisconsin, Florida and Alaska. No material is available on clutch size since data were collected through observations from a light aircraft. Maine has had a 25% decline since 1962 to 24 nests. One hundred and twenty-one young were produced during this time. In Florida Bay the number of pairs has remained stable and this is believed due to a floating population from which lost adults can be drawn. Wisconsin, excluding the Lake Superior population, seems reasonably stable, and Alaska seems to be doing fine. Based on Ratcliffe's Index, there has been a 12% decline in egg shell thickness in Maine (from pre-1947, 0.606 to present 0.535 values based on 17 and 5 eggs respectively), an 11% decline in Wisconsin (from 0.613 to 0.547 based on 33 and 16 eggs respectively) and an 11% decline in Alaska (from 0.615 to 0.550 based on 99 and 7 eggs respectively).

James Grier (Northwestern Ontario). Data from northwestern Ontario indicate there has been no decline either temporally or spatially over the last 4 years.

Table 5. Bald Eagle Data (Sprunt)

	% nests containing 0,1,2,or 3 young				no. of years data	% success	Ave. young fledged/successful nest
	0	*1*	*2*	*3*			
Maine	73	20	7	0	8	27	1.3
Florida	50	30	18	1	10	50	1.4
Wisconsin	36	33	28	3	8	64	1.5
Alaska	37	23	37	2	5	63	1.7

Clayton M. White (Aleutian Islands, Alaska). [This section is an abstract prepared by C. M. White in 1970—Ed.] Fifty-three pairs of Bald Eagles attempted nest construction on Amchitka Island in 1969. Forty-three pairs laid eggs and 33 pairs fledged young. Fledging success was 1.51 young per successful nest and 0.94 young per total nesting attempts. Mean distance between nests was 1.59 straight-line miles (range 0.4 to 7.4 miles).

About 200 eagles are on the island year-round. Sub-adults make up a large part of the population. In June, prior to the fledging of new young, a count on 42 straight-line miles of beach gave 42 to 39 (or a near 1:1) sub-adult to adult ratio. A fall and a winter count gave a 4:5 and a 4:6 sub-adult to adult ratio respectively.

DDE in two eggs was 21.5 and 12.6 ppm on a dry weight basis and 3.27 and 0.75 on a wet weight basis. The shell thickness indexes were 2.87 and 2.42.

On 20 January 1970, 109 straight shore-line miles were flown; 153 adults and 76 sub-adults were counted and 16 nesting stacks were occupied by pairs of adults.

On 26 May 1970, 56 nesting stacks were occupied by pairs of adults while 44 nests contained either young or eggs (75 young on 27 May). Fledging success was not determinable.

Jon M. Gerrard [including work by D. Whitfield] (Saskatchewan). A total population estimate for Saskatchewan was set at 500 pairs. Average young/occupied nest from 1967 to 1969 has been 1.7. Three eggs (all addled) collected in 1968 had a mean DDE residue level of 2.19 ppm (wet) and an egg shell index of 2.88. Table 6 summarizes the Bald Eagles, Golden Eagles and Ospreys observed by D. Whitfield in Saskatchewan in 1968.

Table 6. Saskatchewan Bald Eagle, Golden Eagle, and Osprey Data 1968 (Whitfield)

Territories		*Banded*	*Undisturbed*	*Young*
		Bald Eagle		
Productive	82	36(65)	45	132-139
Unproductive	47			($\bar{X}$=1.6-1.7)
		Golden Eagle		
Productive	6	4(7)		10-11
		Osprey		
Productive	5			

Thomas Dunstan [presented by B. Harrell] (Chippewa National Forest, Minnesota). One hundred and seventeen nests were checked by John Mathisen, 60 nests were active and 29 nests were successful. Forty-four young were produced and 17 were banded. DDE residues from muscle tissue from two nest mates were 4.88 and 20.56 ppm (wet weight) respectively. One other sample had 2.69 ppm DDE.

Ospreys

Paul Spitzer (Long Island, New York and S. New England). The decline of known Osprey nests in the Long Island and southern New England area has been from 800 in 1941 to 91 in 1969. This decline has been characterized by low hatching rate, embryo mortality and egg disappearance. There has been an annual decline of about 30% in Connecticut and 25% in Rhode Island. No relation between remoteness from human populations and nesting success has been established.

Stanley Wiemeyer and Paul Spitzer (Maryland and Connecticut Egg Transfers). To try and determine whether the cause of nesting failure was a result of adult abnormal behavior, food availability, or whether the problem was inherent in the egg itself, a number of experiments involving transfer of eggs was undertaken. Eggs and young from highly contaminated areas were transferred to nests in low contaminated areas and vice versa. It was found almost in every case that eggs from low contaminated areas (or young) did well, whereas those from highly contaminated areas did poorly regardless of where they were put. It was therefore determined that the problem was inherent in the egg and was a result of exposure

to high levels of pesticides by the parent birds before laying time. Adults were found to accept substitute young up to three weeks after their nest had been empty.

Sergej Postupalsky (Michigan). Comparisons were made between the whole state of Michigan Osprey population and an area known as Fletcher Pond which is remote and removed from heavily contaminated areas. The statewide average of nests producing young (based on 310) average 28.3% (1.60 young/producing nest), the Fletcher Pond average was 39.8% (based on 98 nests) (1.79 young/producing nest). The average production of eggs per nest was 3, but only 1.6 per nest at time of hatching, indicating a very high percentage of breakage. It was determined that there was ten times the probability of egg breakage or thinning in regularly failing nests than in regularly producing nests.

Charles Sindelar (Wisconsin). Table 7 summarizes data on Ospreys in Wisconsin between 1966 and 1969.

Table 7. Wisconsin Osprey Data 1966-1969

Year	*1966*	*1967*	*1968*	*1969*
Young/active nest	.83	1.15	.69	.61
Young/producing nest	1.6	1.69	1.55	1.76
Number of nests	45	66	80	89
Number of nests occupied	29	59	65	84
Percent nests 1 young	40	36	46	41
Percent nests 2 young	60	38	46	41
Percent nests 3 young	0	25	7	17

Prairie Falcons

James Enderson (Wyoming, Colorado). Table 8 summarizes reproductive data for Prairie Falcons in Wyoming and Colorado. Numbers of young fledged/pair in brackets are for birds remaining after birds were taken for falconry use.

Donald Hunter (South Dakota). In 1966, 7 eyries within a study area and 11 eyries outside this study area were checked. Thirty-eight young of bandable size were found and 36 had the opportunity to fledge. In 1967, 8 eyries in the study area

Table 8. Prairie Falcons, Colorado and Wyoming (Enderson)

Year	*No. Pair*	*No. Eggs/pr.*	*No. Hatch/pr.*	*No. Fledge/pr.*	*No. Y.f./s.p.*
'60-'62					2.9
'65	27				2.4
'67	16	4.7	2.5	2.2(1.4)	2.5
'68	17	4.5	1.4	1.1(0.6)	2.3
'69	13	4.4		(1.3-1.4)	2.8

had a potential fledging of 4.5/active nest, 4 young in one nest were found shot. In 1968, 13 eyries had a fledging potential of 4.3/eyrie and in 1969 the fledging potential was 4.5/eyrie.

Richard Fyfe (Canadian prairies). Table 9 summarizes the reproductive data on Prairie Falcons in Alberta and Saskatchewan in 6 different areas. Correlation between a decrease in egg shell thickness based on the Ratcliffe Index and an increase in DDE residues has been shown in 36 eggs collected in 1967 and 1968 (Figure 1).

Table 9. Canadian Prairie Falcon Nesting Production[1] (Fyfe)

Area	Occupied territories	Success-pairs	No. of nestlings	N/S[2]	N/O[3]	Egg production
D	13	8	24	3.0	1.7	4.0
A	8	6	21	3.5	2.6	4.7
F	19	14	55	3.9	3.1	3.4
C	14	9	32	3.6	2.7	4.5
E	31	18	66	3.7	2.6	4.7
G	6	5	18	3.6	3.6	4.5
Production	1968			3.57	2.5	
	1969			3.6	2.4	

[1]Production is of 1969.
[2]Nestlings produced per successful pair.
[3]Nestlings produced per occupied territory.

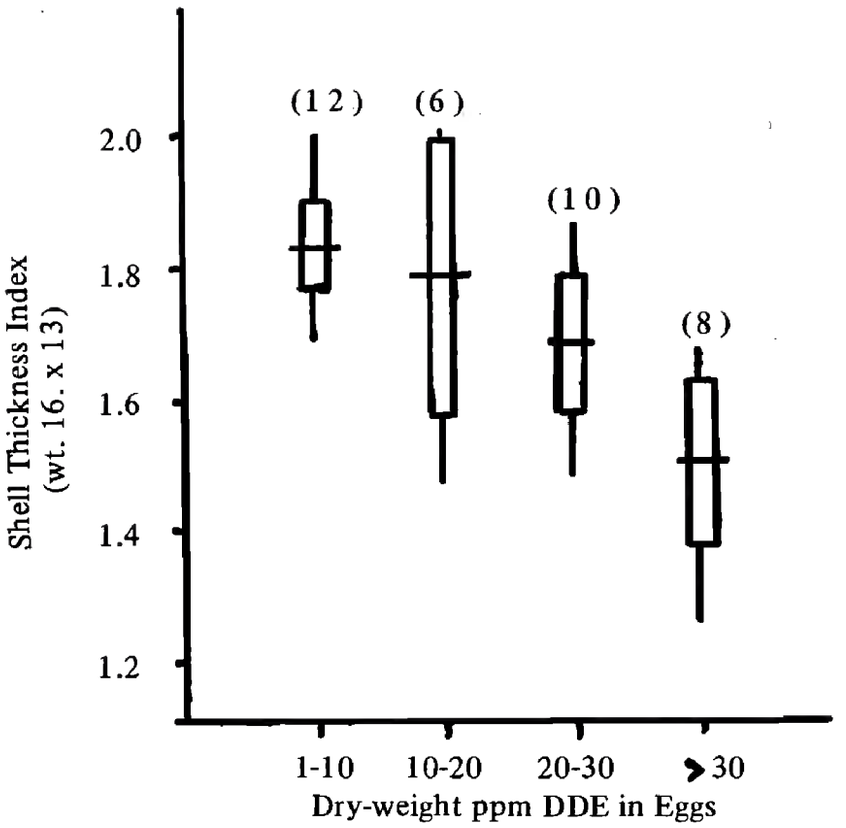

Figure 1. Variation of shell-thickness index with DDE concentration in Prairie Falcon eggs. Sample numbers are in brackets, horizontal lines are means, boxes are 95 per cent confidence limits, and vertical lines are sample ranges.

Merlins

Richard Fyfe (Canadian prairies). Table 10 summarizes known and historically known nesting of Merlins in Saskatchewan and Alberta. A 100% decline is noted in 15 nests previously known in one area of Saskatchewan in 1958 and 1959. Not all areas were re-checked in 1969. The only population of Merlins checked which still appears to be in a healthy state is that in the extensive ranching area of the southern prairies. The region was abandoned as farm land in the 1930's and has been used almost only for grazing since. There has been no recent history of pesticide spraying as far as can be ascertained. In 1968, 2 Merlin nests were found. After a more intensive search in 1969, 10 nests were located. Pesticide levels are high.

Table 10. Richardson's Merlin, Saskatchewan and Alberta.

	Known (Before 1967)	Active 1968	Active 1969	Total
(a)	15	0	?	15
(b)	2	0	1	2
(c)	1	0	?	1
(d)	1	0	?	1
(e)	–	–	10	10
(f)	–	2	10	10
(g)	–	6	1*	6
(h)	–	–	1	1
(i)	–	–	1	1
(j)	–	–	1	1
		8	25	48

*5 not known

Nestlings per nest 43/14	3.1			
Eggs per nest 69/16	4.3			
Tree nest	Total	Magpie	Crow	Unknown
	25	11	9	3
Banded nestlings	36			
adults	1			

Stanley Temple (Newfoundland). Nineteen nesting pairs were found in 1969. Clutch size based on 7 pairs was 4.5/nest; fledging success based on 19 nests was 3.4 young/nest; there appeared to be no mortality in 13 nests up until fledging. The mean DDE residue level was 53.6 ppm (28.5-93) dry weight and the mean Ratcliffe Index was 1.38 (1.2-1.64), based on 4 eggs.

Two male and 1 female sub-adult birds were found breeding. Gray Jays appeared to be the major prey species. Most Newfoundland birds seemed to be migratory, but some are known to winter on the Avalon Penninsula.

The last three weeks of September were spent trapping on Cape Ray and 39 birds were captured. The immature to mature female ratio of 3.2:1 was almost the same as the number of young raised per nest, i.e. mature female, but any correlation between the two is to be much debated. Three hundred and sixteen sightings of Merlins were made.

White-tailed Kites

Peter Ames (California). In the 1930's White-tailed Kites were extremely rare and were given total protection; however, in the 1950's and particularly in the early 1960's there was a great increase in numbers from an estimated few hundred to a present population numbered in the thousands. It is a great mystery why these raptors are on the increase when almost all other raptors are on the decrease from pesticides. The answer must lie somewhere in their food habits, for they are exclusively mouse eaters, which have been among the cleanest biological material tested with respect to pesticides, having less than 1 ppm DDE (wet).

Except in areas where they nest in willows their nesting success is very good and about 20% have a second brood.

Marsh Hawks

Frances Hamerstrom (Wisconsin). Dr. Hamerstrom has had a very sharp decrease in the numbers of Marsh Hawks seen on her study area. In 1959 there were 317 observations; in 1968 there were 34 observations and in 1969 there were 34 observations. She has also noted a very marked behavior change in Marsh Hawks in her area in that the males no longer go through flight display in the spring. In 1963 there were 25 nests on her study area and 60 young were fledged; in 1968, 2 nests fledged 5 young and in 1969, 9 nests fledged 21 young. Marsh Hawks seem very dependent on good mouse years for good nesting success. 1963 and 1969 were both good years for Marsh Hawks and both followed a very heavy snowfall the winter before. It is believed that this snow gave good protection to voles since the grass was not frozen off; also the spring melt resulted in an abundance of water, all factors believed to contribute to the good vole populations in those years. The most marked decrease in breeding, spatially, seems to be in areas of heaviest agriculture and spraying. High levels of lindane have been found in samples. There has also been a 10% reduction in the weight of breeding females, perhaps indicating a general decline in the health of the overall population of Marsh Hawks.

An interesting point brought out was that there does not seem to be any recruitment into the breeding population from locally raised birds, and there have been only 4 young returned from 400 banded birds.

Cooper's Hawks

Noel Snyder and Helen Snyder (Arizona). Work since the conference has led to changes in analyses given in preliminary form at the conference. The report is therefore omitted.

Red-shouldered Hawk

Joseph Hickey (Eastern United States). A decline, only recently realized has occurred in Red-shouldered Hawks, particularly in the eastern states. Table 11 gives some data on a preliminary check on egg shells by D. W. Anderson and J. J. Hickey. A weight reduction of between 2.7 and 10.1% is noted, but the decline cannot be correlated with reduction in egg shell thickness as yet.

Table 11. Red-shouldered Hawk Preliminary Check on Egg Shell Weight (D. W. Anderson and J. J. Hickey).

		N	x ± 95% CL	% Change
Western U. S.	Pre	382	4.15 ± 0.04	
	Post	130	4.04 ± 0.10	-2.7
Coastal Plain	Pre	270	4.21 ± 0.05	
	Post	120	4.11 ± 0.08	-2.3
N. Great Lakes	Pre	139	4.61 ± 0.07	
	Post	30	4.36 ± 0.12	-5.4
S. Appalachians	Pre	20	4.28 ± 0.16	
	Post	19	3.89 ± 0.16	-9.1
S. Texas	Pre	58	4.34 ± 0.12	
	Post	151	3.90 ± 0.08	-10.1

Sergej Postupalsky (Superior Township, Michigan). Table 12 shows a marked increase in Red-tailed Hawks coinciding with a marked decrease in Red-shouldered Hawks that are nesting in the Craighead brothers' study area of the 1940's. A change in habitat and the lower level of ground water are put forward as a possible explanation.

Postupalsky has also noted a general increase in the number of reports on Christmas bird counts of Red-shouldered Hawks coinciding with an increase in the number of counts, up until 1960, and then a dramatic drop to almost 0 by 1968 despite only a very slight decrease in the number of counts since 1960.

Table 12. Red-shouldered Hawk and Red-tailed Hawk Population Changes 1942-1969, Superior Township Michigan (S. Postupalsky).

Year	*1942*	*1948*	*1949*	*1966*	*1967*	*1968*
Red-shouldered Hawk	19	16	14	1	2	1
Red-tailed Hawk	2	5	6	11	9	13

Utah Raptor Surveys

Joseph Murphy. The paper presented was based on a recent publication called "Nesting Ecology of Raptors of Central Utah." The study area consists of 600 square miles of semi-desert shrub which has no pesticide problems, good raptor nesting sites, good prey populations, and little human interference. Raptors include the Golden Eagle, Ferruginous Hawk, Great Horned Owl and Prairie Falcon.

There were 17 Golden Eagle nests in 1969, 7 had eggs and 3 nests raised 3 young. There were 1.13 young/successful nests found, and fledging success was 85%. The high reproductive success of these eagles was credited to a good supply of rabbits.

For Ferruginous Hawks in 1967 there were .67 young hatched per nest, and in 1968 there were 2.3 young hatched per nest. Fledging success was 100%. Forty-five per cent of their prey species consisted of kangaroo rats. They took only a few rabbits.

Prairie Falcons were not considered a common raptor nesting on the study area. In 1968, 4 pair were found. No Prairie Falcon survey was done in 1969.

The breeding distribution of raptors in general over 75 square miles was determined to be 4.5 pairs/square mile. The winter population of Bald Eagles was approximately 100 birds between November and March; they fed mainly on rabbits. The Golden Eagles were generally considered resident, although in colder weather they were supplemented by birds moving in from higher elevations. Shooting was felt to be a great factor in post-fledging mortality among the eagles. Forty-eight were found dead over a two year period, including 26 Golden Eagles, of which 15 were immature. The widespread use of 1080 was felt to be important despite claims

that it did not affect raptors.

Golden Eagles were not felt to be a detriment to the economy of the area in light of the fact that only a single lamb's foot was found in over 200 prey collections. This indicates that these eagles seldom take dead lambs which are very common during the spring.

Discussion

The closing discussion on November 8 and at a post-conference session on November 9 concerned two main topics: the proposed Peregrine survey, and the role of Raptor Research Foundation, Inc. with regard to future research.

One of the first problems dealt with concerning the proposed survey was that of timing. Five year intervals had been suggested for practical reasons with the next one being in 1970, but A. Keith indicated that perhaps five years between surveys was too far apart and not in keeping with the current changes in insecticide usage. Areas such as that in the central barrens in particular, where significant changes have occurred each year for the past few years, should probably be done on a yearly basis if at all feasible in order to detect any important population changes. The crash of the eastern Peregrine populations which occurred almost unrecorded was held as an example, and it was agreed that with the possibility of the critical point being approached in the tundra falcon everything should be done that can be afforded. It was also felt that important productivity data were lacking in many cases, but the difficulties in obtaining early checks at remote eyries, especially in the arctic, was realized.

For all work south of the arctic it was felt that an official survey as such was impossible; rather, it was decided that the best policy should be to have a more semi-official type of a survey, with the persons mentioned earlier being responsible for their area and reporting through some sort of media so that other workers would be aware of what was being done. Conferences to be held every year or every second year was raised as a possible medium together with bulletins distributed from a centralized information source where all information would be pooled.

The value of outside volunteer help was not discounted, especially in view of the great amount of area which needed to be covered by a relatively few people; however, it was felt that no active recruitment for help should be made and any

undue publicity should be avoided. It was also realized that people would be going into some areas regardless, and that it would be best to use these people to the best advantage. A need for some sort of coordination was indicated so situations such as occurred last summer with three parties oblivious of each other on the Yukon River at the same time do not occur.

The importance of keeping track of migrant populations such as that on Assateague Island was questioned in view of the variables involved in such surveys, and also in view of the unknown effects of stress when birds are trapped and the limited return of information from banding.

A discussion on future raptor research generally concluded that emphasis should be directed to more standard behavior studies, both in the wild and captivity, especially in regard to problems dealing with stress, in order that the effects of trapping, banding, taking of tissue samples, etc. could be assessed.

In conclusion it was agreed that with the present status of the Peregrine in North America, the delegates of the conference as a whole should make formal application to declare the Peregrine Falcon an endangered species, and that letters to this effect should go to people responsible in Canada, U. S. A., and Mexico.

Byron Harrell gave a short talk on Raptor Research Foundation, Inc. and indicated that the main purpose of the organization was to provide an information center. A complaint that *Raptor Research News* was not issued sufficiently fast enough was voiced and Dr. Harrell indicated that a secretary has been hired and the publication of the *Raptor Research News* has been contracted out to overcome this problem. He emphasized that RRF is not a falconry organization, being primarily concerned with the scientific aspects of raptor research. Captive breeding projects have been a main concern because of the great interest in this subject at the present time, but it was emphasized that other aspects of raptor research were felt to be just as important.

The possibility of having a formal journal was raised, but Dr. Hickey indicated that he felt it would be a disservice to publish research in a new and obscure journal especially when there were so many others which would handle this type of material.

The main need at this time was felt to be an organization which could coordinate what is being done through rapid information exchange, and it was felt that the Raptor Research

Foundation could fulfill this need if the proper approach were taken, including the introduction of abstracting and computer indexing systems and a regular two-month version of RRN to the present system. It was voiced that more researchers would be inclined to send in material if efficiency were increased, and a plea for material was made.

Appendix A. The Conference Participants included:

Dean Amadon
Peter Ames
Daniel Berger
Robert Berry
Tom J. Cade
James Enderson
Richard Fyfe
Jon N. Gerrard
James Grier
Frances Hamerstrom
Byron Harrell
John R. Haugh
Steven Herman
Joseph J. Hickey
Keith Hodson
Donald V. Hunter, Jr.
Anthony Keith
Eugene Knoder
Jeffrey Lincer
Heinz Meng
Joseph Murphy
David Peakall
R. D. Porter
Sergej Postupalsky
Robert Risebrough
Charles R. Sindelar, Jr.
John Snelling
Helen Snyder
Noel Snyder
Paul Spitzer
Walter R. Spofford
Alexander Sprunt, IV
Lucille Stickel
William Stickel
L. G. Swartz
Stanley Temple
James Weaver
Clayton M. White
Stanley Wiemeyer
William Wimsatt

Appendix B. After the conference, a letter was composed by Tom J. Cade and circulated to the participants and some others for approval or disapproval. It was approved by most but not all. It was then sent to the U. S. Secretary of the Interior, the Minister of Northern Development and Indian Affairs of Canada, and to the Secretaria de Agricultura y Ganaderia of Mexico. The text follows.

Dear Mr. Secretary:

During a conference on birds of prey held at Cornell University, November 7-9, 1969, a group of U. S. and Canadian biologists concluded on the basis of present evidence

that the Peregrine Falcon (*Falco peregrinus*) is an endangered species in all of North America and deserves every protection that can be afforded by the governments of Canada, Mexico, and the United States. As the convener of the conference, I have been asked by those whose names and affiliations appear below to express our deep concern about the status of the Peregrine in North America and to urge the three governments to take such action as seems necessary to preserve this bird from extinction.

As in western Europe, the Peregrine Falcons in North America are victimized by a chemically induced disease caused by hard pesticides of the chlorinated hydrocarbon group, such as DDT and dieldrin. The effects of this disease vary in relation to the amount of pesticide residues in the bodies of adult falcons, but the sickness has several clearly recognizable manifestations. If DDT and derivative residues reach levels of 30 parts per million or more in the brain, death is likely; and there are several documented cases of falcons found dead with pesticide concentrations of this order in their brains. The evidence is also clear that sub-lethal accumulations of pesticide residues affect reproduction in falcons, with the result that the annual production of young birds is insufficient to replace losses in the adult breeding populations. The combined effects of direct mortality and reduced reproductive rate have been responsible for the virtual extinction of the Peregrine as a breeding bird in many parts of its former range in both Europe and America. These catastrophic population declines were well documented by the international group of falcon specialists who met at Madison in 1965 (see "Peregrine Falcon Populations, Their Biology and Decline," edited by J. J. Hickey, University of Wisconsin Press, 1969).

In the United States, there are no longer any Peregrines breeding east of the Mississippi River, and surveys made in the past three years show that the disappearance of breeding pairs at long known nesting sites has continued westward and northward on the continent. Only remnant populations remain in the Rocky Mountains, in Alberta, and along the West Coast from Washington south into Baja California. Even some remote arctic Canadian populations have declined recently.

While some breeding populations in arctic, boreal, and Pacific northwest coastal regions remain unchanged in numbers, it does not follow that these falcons necessarily are in a healthy state. The most quantifiable symptom of the pesticide disease is the production of thin-shelled eggs. This phe-

nomenon, which is unknown in wild bird populations before 1947, has been thoroughly documented in recent years for several species, including the Peregrine populations of both Great Britain and the United States. Thin egg shells are associated with high residue levels of DDE and other chlorinated hydrocarbons in egg contents or in adult falcons, and shell-thinning has been experimentally induced by feeding pesticides to several species of birds, including American Kestrels (*Falco sparverius*) and Prairie Falcons (*Falco mexicanus*), which are near relatives of the Peregrine. In its extreme expression, shell-thinning is associated with an abnormally high incidence of broken eggs in nests and with failure of eggs to hatch.

Biologists have examined eggs from several surviving populations of North American Peregrines in the last three years, and they reported their findings at the Cornell conference. In every case the samples show some degree of shell-thinning, compared with eggs collected from the same regions prior to 1947. These include eggs from Ungava, arctic Alaska, interior Alaska, the Aleutian Islands, and Baja California. In general, the thinner the egg shell is, the higher the residue levels in egg contents or in adult tissues. The arctic Peregrines of Alaska and Canada now lay eggs with shells as thin as those associated with the decimated populations of Great Britain, the eastern United States, and California. From the present evidence, it is probable that all remaining North American Peregrine populations are affected in some degree by pesticide contamination, and if the Peregrine is to survive as a species it is absolutely essential that the use of DDT and related poisons be stopped as soon as possible.

The loss of breeding Peregrines in the settled parts of North America has resulted in greatly increased human attention to the falcons that still survive in the wilder parts, and with modern systems of transportation, even remote arctic nesting sites are readily accessible and have been repeatedly visited since 1965. Falconers, pet-keepers, egg collectors, wildlife photographers, and research biologists have all taken a toll that threatens to continue increasing at an exponential rate, unless this species receives the fullest possible protection. The problem transcends the boundaries of state and provincial jurisdictions and is truly international, as the migrant Peregrines that breed in arctic Alaska, Canada, and Greenland pass southward to winter as far as Argentina.

The current trend toward a sharp reduction in the uses

of DDT and other hard pesticides offers some hope that the Peregrine Falcon will not be completely extirpated from North America. The decline of the Peregrine in Great Britain has evidently stopped, following a reduction in the use of pesticides there. But even after all use of persistent pesticides ends, residues of the chlorinated hydrocarbons will remain as contaminants in the environment for many years to come, so that Peregrine populations will continue in a precarious state for the indefinite future. In order for the Peregrine to make a comeback as a species and to regain range it has now lost, it is essential that the remaining breeding stocks be protected from unnecessary molestation and that the survival of each year's crop of young birds be maximized. With the present greatly reduced population size and lowered reproductive success, the taking of Peregrines for any purpose should be carefully regulated.

The U. S. Fish and Wildlife Service now classifies the taxonomic race of Peregrines called *Falco p. anatum* as an "endangered subspecies." Where one draws the limits of the range of *anatum* in relation to the other North American subspecies, *F. p. pealei* and *F. p. tundrius*, is an entirely arbitrary decision. These are all genetically intergrading and potentially interbreeding populations of one species; and since *pealei* and *tundrius* both include populations that show clear symptoms of the pesticide disease, the only likely way to succeed in preserving this falcon is to declare the entire North American population to be endangered. The moral force of such a declaration by Canada, Mexico, and the United States would place the state and provincial governments, which have legal jurisdiction over the Peregrine, under a strong constraint to tighten their local regulations on man's behavior in relation to this highly esteemed bird.

The foregoing statement has the concurrence of the following conferees who were present at the Cornell meetings in November:

Sincerely yours,

Tom J. Cade
Professor of Zoology

A PILOT PROJECT TO INCREASE THE REPRODUCTIVITY OF PEREGRINE FALCONS IN THE WILD BY ARTIFICIAL MEANS

by
John J. Lejeune
Peregrine Park
Hope, British Columbia, Canada

The purpose of this proposed study is to gather information on the possibility of increasing the productivity of a wild pair of Peregrines by 50-100% in one season. I propose to obtain this information by the following methods.

(1) To locate a Peregrine eyrie characterized by easy accessibility and abundant food species,

(2) To collect the entire clutch of this pair at the earliest possible date after completion,

(3) To incubate these eggs artificially while the second clutch is incubated and raised by the parent birds, and

(4) To raise the young of the first clutch artificially.

Secondarily, it is also possible theoretically to obtain more data on the breeding ecology of the Peregrine.

Discussion. Most authors dealing with the biology of the Peregrine Falcon state that this bird, more readily than any other raptor, produces a second and even third clutch of eggs if the former clutch is lost. Bent (1938) states that only one brood is raised in a season, but if the eggs are taken, the birds will lay a second, or even third, set. Herbert and Herbert (1965) found one female on the Hudson River in 1950 and 1951 laying four (sometimes incomplete) sets.

It is true of course that Peregrines can best be counted on to renest if their first clutch is lost at an early stage of incubation (Hickey 1942, Mebs 1960, and Ratcliffe, in lit.). Greene (1916; see Beebe 1960:162) visited the Queen Charlottes specifically for the purpose of collecting eggs and noted: "when the completed clutch is taken, before incubation begins, the bird begins her fresh set close by the first in about ten days, but if incubation is advanced it will be more like weeks before the new set is laid."

It is my opinion that we can make use and increase the

number of young of a given pair of Peregrines simply by taking the entire clutch of the same at the earliest possible stage and incubating them artificially while the pair will lay and raise a second clutch naturally.

The eyrie chosen for this purpose has to have two characteristics. The first is easy accessibility to insure a safe transport of the eggs in a portable incubator. Also, as it is not necessary to spend much time on the eyrie, the adult birds will be as little disturbed as possible. The second necessity will be an abundance in prey species; this makes the possibility of a second clutch greater and also seems to guarantee a good clutch size. Cade (1960), referring to clutch size, says: "For peregrines this number is clearly dependent upon the density of their prey species or at least upon the availability of prey."

After bringing the eggs in a portable incubator to the final site they should be incubated and hatched under Bantam hens, as hatching of raptorial eggs in incubators has not been 100% successful. As I have raised a Peregrine (*F. peregrinus tundrius*) from an egg, and have kept a proper record of heat and food requirements, there should be no problems after hatching.

Wildlife biologists have developed a method of increasing the total reproduction of Whooping Cranes (*Grus americana*) by removing one of the usually two eggs from the nests, as in nature generally only one young is raised. This procedure would not increase Peregrine reproduction, as these birds raise generally more than one young and only the removal of the total clutch would stimulate the adult birds to lay again.

Conclusion. In populated areas of North America the Peregrine has drastically decreased supposedly due to DDT contamination or other causes. It is my opinion that the discussed method can in two seasons be perfected to increase the reproduction of remnant populations considerably above their natural ability. It could also be used to obtain young birds for scientific or recreational purpose without decimating the natural reproductivity of a Peregrine population.

Several government institutions such as the Pesticide Department of the Canadian Wildlife Service in Edmonton, Alberta, Cornell University, and Patuxent Wildlife Research Center are at present actively engaged in attempting to repro-

duce the Peregrine Falcon domestically. However despite the cost of several hundred thousand dollars of public money for buildings and the care for birds alone these institutions have so far not produced a single young Peregrine. I therefore think that the above explained method is by far more economic, as long as the domestic production of Peregrines is not possible on a broad basis and despite some true successes by individual members of Raptor Research Foundation, I still think that consistent success will not be possible for at least ten years.

It is well known that the Peale's Peregrine, as most other birds, contains various amounts of DDT, and as a certain percentage of this is getting flushed out of the parent bird with the egg, a second clutch should have a lower DDT contamination and a better hatching success. Presst and Ratcliffe (1970) indicate in relation to egg shell thickness and DDT contamination: "Other species with decreased shell thickness and egg breakage still fledge young because they lay repeat clutches which are successful." The only fledged young of a pair of Peregrines in Alberta, where this species has drastically declined, were raised in 1970 by a pair that lost its first clutch of four eggs and renested, laying a second clutch of four and raising three young successfully (Fyfe and Hodson 1970).

The only danger of the project lies in the abandoning of the eyrie site by the parent birds but this seems to be very unlikely as at least most reports in the literature, some by the world's foremost authorities on Peregrines, speak against it. The reproduction of deserting pairs would however not be entirely lost; it would merely depend on the outcome of the first taken clutch.

Until the method has proven to be at least partially successful to the extent that the parent birds have raised a second clutch and/or the first clutch was raised without loss artificially, it should only be applied to a very limited number of eyries, perhaps one or two.

Literature Cited

Bent, A. C. 1938. Life Histories of North American Birds of Prey. *U. S. Nat. Mus. Bull.* 170.

Beebe, F. L. 1960. The Marine Peregrines of the Northwest Pacific Coast. *Condor* 62(3):145-189.

Cade, T. J. 1960. Ecology of the Peregrine and Gyrfalcon Populations in Alaska. *Univ. Calif. Publ. Zool.* 63(3): 151-290.

Fyfe, R. and Hodson, K. 1970. The North American Peregrine Survey 1970, Alberta and Saskatchewan. *Canad. Field Nat.* 84(3):237.

Green, C. deB. 1916. Note on the Distribution and Nesting-habits of *Falco peregrinus pealei* Ridgway. *Ibis* (10)4: 473-476.

Herbert, R. A., and Herbert, K. G. S. 1965. Behavior of Peregrine Falcons in the New York City Region. *Auk* 82(1): 62-94.

Hickey, J. J. 1942. Eastern Population of the Duck Hawk. *Auk* 59(2):176-204.

Hickey, J. J. 1969. Peregrine Falcon Populations. Univ. of Wis. Press.

Mebs, T. 1960. Probleme der Fortpflanzungsbiologie und Bestandserhaltung bei deutschen Wanderfalken (*Falco peregrinus). Vogelwelt* 81(2):47-56.

Presst, I. and Ratcliffe, D. A. 1970. Effects of Organochlorine Insecticides on European Birdlife (Abstract). *Raptor Research News* 4(5):144 (Reprint of pp. 42-43, XV Congressus Internationalis Ornithologicus—Abstracts).

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